10 FRACTURE MATCH EXAMINATION

10.1 Introduction

The process of matching two or more objects either through physical, optical, microscopic, or photographic means, which permits one to conclude whether the objects were either one entity that was broken, torn, or separated, or were held or bonded together in a unique arrangement constitutes a fracture match. The examination may determine whether or not two or more objects were at one time joined and were a part of the same unit. Other related procedures include casting, and microscopic comparison.

10.2 Safety Considerations

Examinations performed in the Firearm and Toolmark Section are inherently hazardous. These procedures involve hazardous chemicals, firearms, ammunition, and power tools. All hazardous procedures must be performed in compliance with the DFS Safety Manual.

10.3 Preparation

NONE

10.4 Instrumentation

- Stereo microscope
- Comparison microscope
- Photographic equipment
- Casting materials
- Other equipment as needed

10.5 Minimum Analytical Standards and Controls

NONE

10.6 Procedure or Analysis

The evidence will be marked in accordance with the Quality Manual. A systematic approach should be used for the fracture match examination, with recording of findings and observations in the notes by documenting and/or photographing the separated items.

- Initial visual inspection of the items submitted would include evidence of:

  Coatings
  Method of separation
  Physical composition
  Color
  Dimensions of items
  Pattern
  Appearance and/or distortions of the separated edges
  Cross-sectional contours
  Incidental striations or scratches
  Extrusion markings
  Conchoidal stress lines and hackle marks
  Trace material

- Note any trace evidence
- If necessary, remove and save the material or contact the appropriate section for an examiner to remove and take custody of the material
- Visually examine the items submitted to determine if they can be physically oriented with one another
- Microscopically examine the oriented edges using a stereo microscope and a comparison microscope, as appropriate, looking for the presence of corresponding irregularities in the oriented edges
- Based on the microscopic evaluation of the objects, determine whether or not sufficient microscopic correspondence exists between the objects to identify them as having been joined at one time as one unit
- A cast of one of the separated edges can be made for comparison with the other separated edge using a comparison microscope

10.6.1 Reporting Formats

The reporting of "fracture match" results falls into 3 categories: positive, inconclusive with additional testing to be conducted (in most situations) and disassociation. Minor variations to these statements may occur and question should be directed to the Director/Section Chief.

Positive:

Items __ and __ were physically fitted together and were at one time a portion of a single unit.

Inconclusive with additional testing to be conducted:

Items __ and __ could not be physically fitted together. The results of additional examinations will be reported separately. (it is recognized that in a few situations further testing will not be possible, therefore, this statement would not be applicable; it is also recognized that in QD the additional examinations will be conducted by QD personnel, thus this statement would not be applicable)

Disassociation:

Items __ and __ could not be associated due to _____. (color, width, construction, thickness, etc., providing a reason for the disassociation, which could be of investigative importance to the investigating officer)

10.7 Appropriate Appendices

Appendix - Calibration Standards

Appendix - Work Sheets

10.8 References

Dixon, K.C. "Positive Identification of Torn Burned Matches with Emphasis on Cross Cut and Torn Fiber comparisons". American Academy of Questioned Documents Examiners. August, 1982.

Funk, H.J. "Comparison of Paper Matches." Journal of Forensic Sciences. Vol. 13, No. 1. 1968.

Glossary of the Association of Firearms and Toolmark Examiners. 3rd ed. page 79.

Kirk, P.L Crime Scene Investigation. 2nd ed. John Wiley & Sons: New York. 1974.

Saferstein, R. Ed. Forensic Science Handbook. Chapter 4. "Forensic Glass Comparisons". p. 151-153. Prentice-Hall, Inc.: New York. 1982.

Thorton, John I. "Fractal Surfaces as Models of Physical Matches". Journal of Forensic Sciences. Vol. 31, No. 4, Oct. 1986. p. 1435-1438.

Van Hoven, H.A. and H.D. Fraysier. "The Matching of Automotive Paint Chips by Surface Striation Alignment". Journal of Forensic Sciences, Vol. 28, No. 2. 1983. p. 463-67.

Von Bremen, U.G. and L. Blunt. "Physical Comparison of Plastic Garbage Bags and Sandwich Bags". Journal of Forensic Sciences. Vol. 28, No. 3, July, 1983.

Zugibe, F and J. Costello. "The Jigsaw Puzzle Identification of a Hit and Run Automobile". Journal of Forensic Sciences. Vol. 31, No. 1, 1986. p. 329-32.

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